Factors affecting teachers’ perceived readiness for online collaborative learning: A case study in Malaysia

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ABSTRACT
This paper investigates factors affecting the perceived readiness for online collaborative learning (OCL) of a sample of 86 mathematics teachers from 12 secondary schools. Descriptive analysis, factor analysis, confirmatory factor analysis and structure equation modeling were used to analyze the data. A moderately fit model was generated and able to inform that time constraint and insufficient access to technology such as computer and the Internet were confirmed to be the two impediments to OCL as perceived by the teachers. Besides, a new factor emerged, namely the factor of new learning paradigm, has shown positive impact on the teachers’ perceived readiness for OCL. A majority of them agreed that school principal, training and guidance on OCL play an important role to support the implementation of this novice approach in schools.

Keywords
Secondary school education, Online learning, Computer-mediated communication, Cooperative and collaborative learning

Introduction
The use of computer mediated communication tools for collaborative and group learning can be introduced in schools as part of the initiative to promote meaningful learning and active learning (Jonassen, 1996; Jonassen, Howland, Moore & Marra, 2003; Duffy & Cunningham, 1996). Jonassen (1996) identified these online communication tools can be used to engage learners in the negotiation of meaning, sharing of ideas and information, and certainly, this approach of learning can be enhanced through collaborative learning.

In online collaborative learning (OCL), learners are able to interact and discuss with their peers, teachers or others conveniently in regard to their formal or informal studies. The contents for their discussion can be of any topics, depending on the type of project they are working on.

Malaysian secondary school education, however, has always been labeled as teacher-centric and examination oriented (Lim & Hua, 2007; Indramalar & Chapman, 2003). This educational approach is quite common in Asian schools and has been labeled as rote learning, rigid and stifles creativity (Beech, 2002). Measurements should be taken to promote fun education rather than focusing on examination (Goh & Chapman 2006; Khusairi, Zulkifly & Zanariah, 2005). In this sense, OCL could be one of them. In Malaysia, OCL is new for secondary schools and teachers’ readiness for OCL is yet to be explored.

Factors affecting teachers’ readiness for online learning
Access and digital divide have always been an issue for e-learning in many countries. Levin and Thurstan (1996) and Philson (1999) raised the issue of infrastructure and access to technology as the factors affecting online learning. Philson (1999) conducted a study to examine the convergence of technology and collaboration by focusing more on international perspectives. A web-based survey was administered to randomly selected list serve members representing different disciplinary areas. A total of 702 usable responses were received from individuals in 23 different disciplines at institutions in 50 countries. Statistical analyses were conducted such as correlations, Anova and regressions, with the dependent variable focusing on collaboration. The independent variables were the impact of access, disciplinary focus, age, sex, language, income level, skill and training, and institutional characteristics.

The results indicated that access was the most significant predictor of collaboration, followed by the individual's language (with those speaking English as a native language less likely to collaborate), the discipline (with those in the more difficult disciplines more likely to collaborate), experience in using e-mail (those with more experience
collaborate more), the number of years in the discipline (the higher the number, the greater the collaboration), and self-rating on skill level (the higher the rating, the greater the collaboration). Several factors significantly correlated with access. They are: discipline, language, skill, problems with the technology, and experience. A strong relationship was also found between access and per capita income levels in the country of the participant.

On the other hand, some researchers reiterate that technology adoption or diffusion in any context depends on shared negotiation of values and priorities, particularly on how the technology fits into the existing social purposes and practices of the community (Wilson, Sherry, Dobrovolny, Batty & Ryder, 2002; Fishman, 2000; Hiltz, 1988). The shared negotiation of values and priorities will largely determine the prospect, the appropriateness and the use of technology by the community (Wilson et al., 2002). Cuban (1986) revealed that many educational technologies failed to be adopted meaningfully by teachers because the designers failed to properly address the norms and practices of classrooms or in other words, “classroom culture”. Fishman (2000) added that in order to bring an innovation to scale, it is important as the first step to understand how the innovations are adopted in local contexts. Hence, it is recommended that if any online pedagogical approach is going to be used by students in school, there must be a good fit with the teacher's intentions, perceptions, and actions with respect to the classroom culture (Fishman, 2000).

ICT initiatives in local context

Malaysia has her long-term vision, “Vision 2020” which calls for the whole nation’s preparation to face the challenges in the global economy of the 21st century. At the same time, Malaysia’s National Philosophy of Education also calls for developing the potential of individuals in a holistic and integrated manner, which means to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious. With this in mind, ICT is seen as a powerful tool to act as a catalyst to the above visions. There are initiatives and measurements taken in order to realize the use of ICT in education such as Smart School Project, MySchoolNet project, the computerization program in schools, etc (Chan, 2002).

In 1997, Malaysia promoted the use of ICT in schools through the launching of the Malaysian Smart School Project, indicating that the goals of Smart School Education are “to provide opportunities to enhance individual strengths and abilities and to produce a thinking and technology-literate workforce” (Malaysia MoE, 1997, p. 22). This project does not just emphasize the use of technology; it also emphasizes a transformation of the entire educational system which includes the enhancement of curriculum, pedagogy, assessment and teaching-learning materials in order to support student-centered teaching and learning approaches (Malaysia MoE, 1997). More recently, Malaysian government has reiterated the importance of cultivating creative, discovery-oriented and risk-taking citizens and called for a more serious effort to plan for the implementation of Smart School Project by year 2020 (Multimedia Development Corporation, 2005; Khusairi et al., 2005; Goh & Chapman, 2006).

Issues faced in ICT adoption in schools

In these endeavors, however, there are some issues or hindrances faced. Gan (2001) has outlined some factors which caused the slowness of adopting ICT in schools. One of the main issues is the high cost of purchasing and maintaining computers used in schools. Until now, this is a major problem faced although it has not been explicitly stated. Other relevant issue is the insufficient teacher training and most of them have not gained enough exposure of using computers for education. Formal training is a must for the teachers as they play an important role to incorporate ICT in education.

As for the research in OCL, Lee and Zulkipli (1999) identified factors which hindered their studies of network collaborative writing class: 1) Lack of access to the Internet (cost and support), 2) constraints from school administration as the activity was regarded as not pertinent to the curriculum (integration issues), 3) difficulty in gauging and maintaining partners' commitment (group learning issues) and 4) the unfamiliar use of graphical-based chat software (skills in technology).

On the other hand, there were reports raised about the issue of heavy workload faced by the Malaysian teachers (Lim & Hwa, 2007; Koh, 2004). This is partly due to the influence of examination oriented culture and ‘finish syllabus
syndrome’, resulting the impediments of promoting mathematical thinking teaching and learning (Lim & Hwa, 2007). Koh (2004) reported that teachers’ workload increased due to the non-instructional work or administrative works in schools. Because of heavy workload, teachers have less time or less initiative to adopt new teaching approaches in their lessons.

Overall, research focusing on OCL or online projects for Malaysian secondary schools is limited. Kamarul and Amin (2004) discussed the lack of documentation on the involvement of Malaysian secondary school teachers in online networking projects. In many countries, online learning in secondary schools is relatively under-researched (Kane, 2004; Fishman, 2000). Kane (2004) noted that at school level in particular, there remains a need to identify "educationally sound" ways of getting students online.

Koo (2001) conducted a pilot study on the perception of 28 primary and secondary school teachers on OCL. The findings showed that half of the respondents (52%) were relatively new to OCL. Majority of them (76%) were keen to collaborate with other teachers for educational purposes. They believed that OCL is useful and effective for teaching and learning. However, most of them (68%) felt that they were not ready for implementing OCL and a majority of them (85%) expressed that they need training and guidance.

**Purpose of the study**

The purposes of this study are 1) To describe the teachers’ perception of implementing OCL in their schools and 2) To investigate factors affecting Malaysian mathematics teachers’ readiness for OCL to enrich their mathematics lessons in schools. This study used multivariate analysis to establish the significance of the relationship between the depending factors with the teachers’ perceived readiness for OCL approaches.

By conducting this study, it is hoped that the key factors of affecting the teachers’ readiness for OCL can be identified and be informed to the school management and the ICT policy maker, so that any ICT program involving collaborative approach can be conducted more successfully in the future.

**Methodology**

This research used survey approach to investigate various aspects on online collaborative learning and its implementation in schools. The survey questionnaire was a self-constructed 32 questionnaire items, with 6-points Likert scale, to measure teachers’ attitude towards OCL. This instrument was adapted and enhanced from a pilot study conducted by Koo (2001). The participants involved were 86 mathematics teachers from twelve public secondary schools located not more than 50km to the central location of Malaysia Multimedia Super Corridor (MSC), namely Cyberjaya. The MSC is a test-bed that has been implemented to increase Malaysian participation in the Digital Age. Permissions from the Ministry of Education and school principals were formally sought before the survey was conducted. Approximately 90% of the mathematics teachers in each school were approached individually to complete the questionnaire. The response rate from the distribution of 120 questionnaires was 72%. However, two responses did not answer completely and were omitted from the analysis.

**The respondents and their profiles**

From a total of 86 mathematics teachers, majority of them were female (86%) and Malay (69%). Most of them (83%) had more than 5 years of teaching experience. Most of them (77%) taught 31-40 students in a class and a small percentage of them (7%) responded that they taught 41-50 students in a class. More than half of them (58%) taught mathematics for 21-30 periods in a week, with each period lasting for about 40-45 minutes. Most of them (94%) had computers at home and 67% of them were able to access the Internet from home. Among these teachers, 24% of them frequently using the Internet, 47% of them hardly (never or seldom) using it and the rest (29%) were occasionally using it. For computer competency, 21% of them were good or expert, 44% were intermediate, 30% were novice and 5% were totally incompetent of using computer.
Data Analysis

Two data analysis approaches were used to analyze the data, i.e. descriptive data analysis and structure equation modeling (SEM) approach. Findings for these analyses are reported in each section.

Descriptive Data Analysis

The descriptive data and findings of the 32 items were reported in Table 1 in which the lowest to the highest mean score for each item or statement was listed accordingly.

<table>
<thead>
<tr>
<th>Initial Dimensions</th>
<th>Item code</th>
<th>Statements</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>n</th>
<th>mean</th>
<th>std dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived readiness Collaborative intention</td>
<td>e45</td>
<td>OCL can be easily implemented in school.</td>
<td>5</td>
<td>19</td>
<td>13</td>
<td>36</td>
<td>12</td>
<td>1</td>
<td>86</td>
<td>3.4</td>
<td>1.18</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e55</td>
<td>From my experience, “collaboration” among teachers usually succeeds to achieve its objectives.</td>
<td>2</td>
<td>11</td>
<td>37</td>
<td>22</td>
<td>12</td>
<td>2</td>
<td>86</td>
<td>3.43</td>
<td>1.04</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e43</td>
<td>In my opinion, parents are ready for OCL.</td>
<td>1</td>
<td>16</td>
<td>25</td>
<td>33</td>
<td>9</td>
<td>2</td>
<td>86</td>
<td>3.45</td>
<td>1.03</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e44</td>
<td>The educational culture in school is ready for OCL.</td>
<td>3</td>
<td>18</td>
<td>16</td>
<td>32</td>
<td>14</td>
<td>3</td>
<td>86</td>
<td>3.52</td>
<td>1.19</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e42</td>
<td>In my opinion, students are ready to use OCL in their lessons.</td>
<td>0</td>
<td>11</td>
<td>19</td>
<td>38</td>
<td>15</td>
<td>3</td>
<td>86</td>
<td>3.77</td>
<td>1</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e41</td>
<td>I am ready to use OCL in my teaching.</td>
<td>0</td>
<td>11</td>
<td>19</td>
<td>30</td>
<td>21</td>
<td>5</td>
<td>86</td>
<td>3.88</td>
<td>1.1</td>
</tr>
<tr>
<td>Time</td>
<td>e72</td>
<td>I don’t think I have time for OCL.</td>
<td>1</td>
<td>7</td>
<td>20</td>
<td>29</td>
<td>24</td>
<td>4</td>
<td>85</td>
<td>3.94</td>
<td>1.07</td>
</tr>
<tr>
<td>Perceived readiness</td>
<td>e46</td>
<td>I think I want to use OCL in my teaching.</td>
<td>1</td>
<td>6</td>
<td>13</td>
<td>36</td>
<td>20</td>
<td>6</td>
<td>82</td>
<td>4.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Access to technology</td>
<td>e63</td>
<td>Teachers and students can use their home computer and the Internet for OCL.</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>36</td>
<td>34</td>
<td>3</td>
<td>86</td>
<td>4.19</td>
<td>1.05</td>
</tr>
<tr>
<td>Implementation in schools</td>
<td>e21</td>
<td>OCL can be incorporated into classes.</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>40</td>
<td>29</td>
<td>3</td>
<td>85</td>
<td>4.22</td>
<td>0.84</td>
</tr>
<tr>
<td>Access to technology</td>
<td>e61</td>
<td>There is insufficient number of computers in my school for teaching and learning.</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td>25</td>
<td>28</td>
<td>13</td>
<td>85</td>
<td>4.28</td>
<td>1.23</td>
</tr>
<tr>
<td>Collaborative intention</td>
<td>e52</td>
<td>I would like to collaborate with teachers from other countries for educational purposes.</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>33</td>
<td>37</td>
<td>4</td>
<td>86</td>
<td>4.34</td>
<td>0.89</td>
</tr>
<tr>
<td>Access to technology</td>
<td>e62</td>
<td>There is insufficient Internet access in my school for teaching and learning.</td>
<td>1</td>
<td>7</td>
<td>11</td>
<td>19</td>
<td>33</td>
<td>14</td>
<td>85</td>
<td>4.39</td>
<td>1.22</td>
</tr>
<tr>
<td>Collaborative intention</td>
<td>e54</td>
<td>I would like to collaborate with people with different expertise for educational purposes.</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>32</td>
<td>43</td>
<td>3</td>
<td>86</td>
<td>4.47</td>
<td>0.75</td>
</tr>
<tr>
<td>Implementation in schools</td>
<td>e23</td>
<td>Academic assessment which is purely based on examination could be a hindrance to OCL.</td>
<td>0</td>
<td>5</td>
<td>9</td>
<td>25</td>
<td>32</td>
<td>14</td>
<td>85</td>
<td>4.48</td>
<td>1.08</td>
</tr>
<tr>
<td>Collaborative intention</td>
<td>e51</td>
<td>I would like to collaborate with my colleagues in the same school for educational purposes.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>34</td>
<td>47</td>
<td>4</td>
<td>86</td>
<td>4.63</td>
<td>0.6</td>
</tr>
<tr>
<td>Perceived positive effect</td>
<td>e38</td>
<td>OCL makes learners more responsible for their own learning (self-paced learning).</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>21</td>
<td>52</td>
<td>6</td>
<td>86</td>
<td>4.64</td>
<td>0.8</td>
</tr>
<tr>
<td>Collaborative</td>
<td>e53</td>
<td>I would like to collaborate with</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>32</td>
<td>44</td>
<td>7</td>
<td>86</td>
<td>4.64</td>
<td>0.68</td>
</tr>
</tbody>
</table>
### Intention

Teachers from other school(s) in Malaysia for educational purposes.

### Perceived Positive Effect

- **e37** Teachers or students who use OCL will reflect (self-analyzed) more on their own teaching or learning.
  - 0 1 4 25 47 9 86 4.69 0.77
- **e34** OCL is able to cultivate positive attitude in learning (e.g. self-discipline, appreciate knowledge and skills, share knowledge).
  - 0 0 3 23 55 5 86 4.72 0.63
- **e310** OCL would increase the participation of various parties such as parents, professional, organization, etc in education.
  - 0 0 4 27 42 13 86 4.74 0.77
- **e71** OCL requires extra time and effort on the part of teachers.
  - 0 2 2 24 45 12 85 4.74 0.82
- **e22** OCL is suitable for extra curriculum activities in schools such as club activities, or activities during school holidays.
  - 0 0 6 21 44 15 86 4.8 0.81
- **e311** The Internet is able to change the way of teaching and learning in education.
  - 0 1 1 25 45 14 86 4.81 0.76
- **e39** OCL can provide more expertise and wider scope of knowledge in a particular subject matter.
  - 0 0 1 26 45 14 86 4.83 0.7
- **e32** OCL is able to enhance learners’ knowledge in mathematics and geometry.
  - 0 0 1 21 55 9 86 4.84 0.61
- **e35** Through collaboration, OCL is able to promote the application of knowledge and skills rather than rote learning.
  - 0 0 2 20 53 11 86 4.85 0.66
- **e33** OCL is able to promote the acquisition of skills (e.g. communication skills, computer skills, problem solving skills, etc)
  - 0 0 1 19 57 9 86 4.86 0.6
- **e31** OCL has the potential of practicing teamwork and sharing of knowledge.
  - 0 0 1 18 56 11 86 4.9 0.61
- **e36** OCL is able to cultivate creativity among teachers and students.
  - 0 0 1 20 47 18 86 4.95 0.7
- **e81** I need more training and guidance to implement OCL.
  - 0 1 3 15 38 29 86 5.06 0.87
- **e82** School principal plays an important role in supporting the implementation of OCL in school.
  - 0 0 1 11 39 35 86 5.26 0.72

Notes: Likert scale, 1 and 2 for disagree (with 1 measures strongly disagree), 3 and 4 for undecided (with 3 measures slightly disagree and 4 measures slightly agree), 5 and 6 for agree (with 6 measures strongly agree).

### Some Key Findings

One of the key findings indicates that more than half of the teachers were undecided on their own readiness (item e41 and e46) and their perceived readiness of other parties such as their students, their students’ parents and their schools for using OCL (item e45, e43, e42). The mean score for items related to perceived readiness were comparatively lower than other dimensions with its value between 3 and 4 (undecided).
In describing their perception of collaborative outcomes with other teachers (item e55), a majority (69%, 59 out of 86) of them was uncertain on the outcomes, either succeed or fail. This can be interpreted that the respondents were not able to judge on their collaborative experiences would lead to success or failure. However, many of the teachers (about half of them, with mean value around 4.6) were quite positively perceived their intention to collaborate with their colleagues or experts (item e53, e51, e54) for educational purposes.

Another finding is to reveal that more than half of the respondents (58%) were undecided whether they have time for OCL (item e72), and 33% (28 out of 85) of them said that they don’t have time for it (item e72). Only 9% of them agreed that they have time for OCL, and this reflects that time constraint could be a major impediment to affect the teachers’ perceived readiness for OCL. Apart from that, the insufficient access to the Internet could be another impediment for conducting OCL in schools as half of them (55%, 47 out of 85) admitted that they faced this problem (item e62). Almost half of the respondents (48%, 41 out of 85) admitted that they have limited access to computers in schools (item e61).

The respondents, however, strongly agreed that factors such as guidance or training and support from school principal are the important dimensions to prepare them for OCL. A majority of them (86%, item e82) agreed that their school principals play an important role to support their efforts of implementing OCL in schools. A majority of them (78%, item e81) highlighted the important of guidance or training on OCL is important for them to be more competent in using this novice approach.

Other feedbacks are quite predictable as they perceived the effects of OCL positively, especially to cultivate creativity (76%, item e36) and team work and sharing of ideas among learners (78%, item e31).

Overall descriptive findings (Table 1) were quite consistent with the findings conducted in the pilot study (Koo, 2001). However, these findings were not sufficient to explain in detail of the associations among the factors identified. The following section explains the association through factor analysis and structure equation modeling.

**Factor Analysis and Structural Equation Modeling**

Firstly, the internal consistency of the survey items was sought by running a reliability test using SPSS version 10. The overall reliability of Cronbach’s alpha was estimated at 0.8454, with 86 cases and 32 survey items. This value has exceeded the minimum threshold for the internal reliability test, i.e. 0.7 (Nunnally, 1978).

The data was then analyzed using (1) factor analysis, (2) confirmatory factor analysis or measurement model before proceed to the next step, (3) Structural Equation Modeling (SEM).

**(1) Factor Analysis**

According to Tabachnick and Fidell (2001), it is quite common to use principal component analysis as a preliminary extraction technique, followed by other technique(s) with varying number of factors, communality estimates, and rotational methods with each run. Analysis ends when the researcher decides on the preferred solutions (Tabachnick & Fidel, 2001, p. 611). Hence, the exploratory factor analysis with principal component extraction and varimax rotation method was first conducted.

Based on the results and also with the consideration of higher factor loadings (0.6 and above), six factors were extracted. These factors were quite consistent with the initial or predefined factors in the questionnaire; except for one new factor that emerged (Factor 4 in Table 2), which was identified as “New Learning Paradigm” explained by item e38 and e311.

The reliability test for items within each factor was calculated. Table 2 shows the Cronbach’s alpha value for each factor. As a rule of thumb, the acceptable Cronbach’s alpha value should be at least 0.7 (Hair, Anderson, Tatham & Black, 1998, p. 118).
Table 2. Extracted factors and its Cronbach’s alpha

<table>
<thead>
<tr>
<th>Factors and description</th>
<th>Survey items with factor loading &gt;0.6</th>
<th>Cronbach’s alpha (Internal reliability coefficient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1 Perceived positive effects of OCL</td>
<td>e31, e32, e33, e34, e35, e36, e37, e39</td>
<td>0.9264</td>
</tr>
<tr>
<td>Factor 2 Perceived readiness</td>
<td>e41, e42, e43, e44, e45</td>
<td>0.9256</td>
</tr>
<tr>
<td>Factor 3 Collaborative intention or tendency</td>
<td>e51, e52, e53, e54</td>
<td>0.8505</td>
</tr>
<tr>
<td>Factor 4 New learning paradigm</td>
<td>e38, e311</td>
<td>0.7249</td>
</tr>
<tr>
<td>Factor 5 Insufficient access to technology</td>
<td>e62, e61</td>
<td>0.8895</td>
</tr>
<tr>
<td>Factor 6 Time constraint</td>
<td>e72</td>
<td>--</td>
</tr>
</tbody>
</table>

Figure 1. Standardized estimates of the measurement model

(2) Confirmatory Factor Analysis or Measurement Model Analysis

In Confirmatory Factor Analysis (CFA), items that have low loadings in factor analysis on the respective factors are constrained to zero (Hair et al., 1998, p. 616-617) and will not be used to describe the constructs in the measurement model. For a sample size around 85, items with factor loadings more than 0.6 will be accepted to describe the respective factors (Hair et al., 1998, p. 112).
In total, 22 out of 32 items were used to describe six factors. Figure 1 shows the measurement model and its related measurements such as standardized regression weight (numeric labels at the single arrow lines), squared multiple correlation (number labels at the top left or right corner of the boxes or observed variables) and correlations (numeric labels at the double arrow lines). All of the items (observed variables) were significant to manifest its construct at alpha = 0.001, which indicates that the measurement model was reasonably valid and the retained items were able to measure the constructs under study.

In addition, “the new learning paradigm” construct seems to have significant positive correlation with another two constructs, “Perceived Positive Effect” and “Collaborative Intention”, at P < 0.01.

(3) Structural Model Analysis

Further analysis for structural model was conducted in order to test the hypothesis of whether the extracted factors or constructs affect the perceived readiness for OCL in schools. The basic structural model was tested and modified until it was both theoretically meaningful and statistically well fitting. Three correlation paths (Figure 2, paths with double arrows) for the three factors (NewLearningParadigm, Collaborative and Perceived+Effect) were established in order to get a better fit result. These correlations could also be explained theoretically, and were proven to be significant based on the previous analysis in the measurement model.

Figure 2 shows the final structural model with the respective estimated parameters which has the best fit result. The estimation of the structural model yields a chi-square of 356.3, df. = 202 and P < .001. Table 3 shows the goodness-of-fit statistics for the structural model.

![Figure 2. Standardized estimates of the structural model](image-url)

Table 3 shows the structural model which demonstrates a moderate fit to the data. The $\chi^2 / df$ and RMR indices are within the recommended range, and the other indices are quite close to the recommended value. Overall, the model is considered moderately acceptable.
In order to test the hypothesized paths for the structural model, the statistical significance of all causal paths in the model were examined. Table 4 shows the parameter estimates and the hypothesis-testing results. These results were also labeled in Figure 2.

### Table 3. Goodness-of-fit indices for the structural model

<table>
<thead>
<tr>
<th>Fit Statistics</th>
<th>Recommended values (Hair et al., 1998)</th>
<th>Value for this model</th>
<th>Does the value of this model meet the recommended value?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$ (df)</td>
<td>Not significant</td>
<td>P = 0.000 (Significant)</td>
<td>No</td>
</tr>
<tr>
<td>$\chi^2$/df</td>
<td>Between 1 and 2</td>
<td>1.764</td>
<td>Yes</td>
</tr>
<tr>
<td>Goodness-of-fit index (GFI)</td>
<td>Close to 1</td>
<td>0.746</td>
<td>Moderately close to the recommended value</td>
</tr>
<tr>
<td>Adjusted goodness-of-fit index (AGFI)</td>
<td>&gt;0.80</td>
<td>0.682</td>
<td>No</td>
</tr>
<tr>
<td>RMR (Root mean square residual)</td>
<td>&lt;0.08</td>
<td>0.056</td>
<td>Yes</td>
</tr>
<tr>
<td>Tucker-Lewis index (or TLI or NNFI)</td>
<td>&gt;0.90</td>
<td>0.863</td>
<td>Close to the recommended value</td>
</tr>
</tbody>
</table>

### Table 4. Regression weights of the structural model

<table>
<thead>
<tr>
<th>Causal Relationship</th>
<th>Regression Weights (Unstdized Estimate)</th>
<th>Std Error</th>
<th>Critical Ratio</th>
<th>P Value</th>
<th>Regression Weights (Stdized Estimate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PReadiness &lt;--- NewLearningParadigm</td>
<td>0.579</td>
<td>0.357</td>
<td>1.624</td>
<td>0.104</td>
<td>0.403</td>
</tr>
<tr>
<td>PReadiness &lt;--- Perceived+ Effect</td>
<td>-0.072</td>
<td>0.458</td>
<td>-0.156</td>
<td>0.876</td>
<td>-0.038</td>
</tr>
<tr>
<td>PReadiness &lt;--- Insufficient Access</td>
<td>-0.151</td>
<td>0.087</td>
<td>-1.727</td>
<td>0.084*</td>
<td>-0.188</td>
</tr>
<tr>
<td>PReadiness &lt;--- e72(Time Constraint)</td>
<td>-0.335</td>
<td>0.081</td>
<td>-4.154</td>
<td>***</td>
<td>-0.394</td>
</tr>
<tr>
<td>PReadiness &lt;--- Collaborative</td>
<td>0.146</td>
<td>0.172</td>
<td>0.852</td>
<td>0.394</td>
<td>0.105</td>
</tr>
</tbody>
</table>

Notes: Squared multiple correlation coefficient, $R^2$ for PReadiness(PerceivedReadiness) = 0.371  
*** denotes significant at $\alpha = 0.001$  
* denotes significant at $\alpha = 0.1$.

### Key Findings

The analysis of the Structural Equation Modeling (SEM, Table 4 and its path diagram in Figure 2) shows the following results:

- The indicator of “time constraint” had a significant negative effect (P < .001) to predict teachers’ perceived readiness for OCL in their schools.
- The factor of “insufficient access to technology” had a marginally significant effect (P < .1) in predicting teachers’ perceived readiness for OCL in their schools.
- The factor of “new learning paradigm” which is due to the advent of the Internet and its impacts in education had a high value of standardized regression weight (the highest, i.e. 0.4) to predict positively the teachers’ perceived readiness for OCL. Hence, this factor could also be able to predict teachers’ perceived readiness for OCL.
- The other factors, namely the “collaborative intention” and the “perceived positive effect of OCL” were correlated positively with the “new learning paradigm” factor (with P < 0.01). In other words, there were interactions among these factors.
- The teachers’ perceived positive effect of OCL and their collaborative intention have no effect on their perceived readiness for OCL.
- The R squared (squared multiple correlations) for the endogenous variable, namely the perceived readiness, was 0.371, which means that the structural model was able to explain 37.1% of the variance or variability of the
teachers’ perceived readiness for OCL. The factors in the model such as the perceived positive effects of OCL, the collaborative intention, the new learning paradigm, the insufficient access to technology and the time constraint, could explain 37.1% of the variability of the teachers’ perceived readiness for OCL.

**Discussions**

The respondents were not highly perceived their readiness for OCL as a majority of them were undecided on the items related to this construct. This could be due to their time constraint as they were busy with their classroom teaching and school administrative works (Lim & Hwa, 2007; Koh, 2004). They have reasonably heavy teaching workload to teach many periods in a week and to handle many students in a class. Moreover, many of the respondents did not have much exposure in using computer or the Internet for collaborative purposes as they hardly used the Internet for teaching and learning. Some of them might not have much computer competency as they were novice or they might have difficulties in accessing the Internet at schools. Feedbacks or findings will be different if they have more exposure to the Internet and computer for online collaborative learning purposes.

OCL can be more successfully carried out by teachers if it gains supports from school’s principal or school’s management. Teachers would feel that their efforts on OCL are worthwhile if their school recognized their involvement in OCL. They also feel that they need to attend training or to seek more guidance from the experienced teachers in terms of OCL.

In factor analysis, the newly emerged factor, the new learning paradigm, was manifested by two indicators: 1) The Internet is able to change the way of education, and 2) OCL makes learners more responsible for their own learning (self-paced learning). The advent of ICT has changed the way how teachers perceive education. This factor depicts the kind of new learning paradigm which requires learners to be more responsible for their own learning. This is in line with the recent promotion of learner-centered pedagogical approach (Hirumi, 2002; Duffy & Cunningham, 1996), lifelong learning in education and society due to the advent of ICT and e-learning (Garrison & Anderson, 2003).

Although factors like teachers’ perceived positive effects and their intention for collaboration did not significantly affect their perceived readiness for OCL, these two factors are positively correlated to the teachers’ perception of the new learning paradigm. This means that the stronger the belief in the new learning paradigm, especially on the belief that the Internet is able to change the way of education, the more positive perception of the teachers in viewing the effects of OCL, and the greater their intention to collaborate with others for educational purposes. The new learning paradigm has brought much impact to the realm of education, and the role of the Internet should not be neglected as a factor affecting teachers’ perception, belief and intention of using OCL.

Time constraint is a factor affecting teachers’ perceived readiness for OCL in their schools. Another factor that also moderately affects teachers’ readiness for OCL is insufficient opportunities to access computer and the Internet. These findings are useful to confirm and support the descriptive finding that time constraint and insufficient access to technology are the two impediments for OCL. In order to prepare the teachers to be more ready for OCL activities, school management should allocate time slots for teachers to be formally involved in OCL-related activities. This would be a promising way to increase their readiness for OCL.

Apart from that, schools should provide more access to technology such as computer and the Internet. Access to the Internet at schools is still the key issue that needs to be addressed before introducing any Internet-based teaching and learning approaches in schools (Philson, 1999; Lee & Zulkifli, 1999). To overcome this issue, the number of computers with Internet access should be increased and the mechanism of using them should be made easy and flexible, without being bounded by rigid timetables, rules and regulations of accessing these technologies.

Factor of “new learning paradigm” also affects teachers’ readiness for OCL. Another factor, new learning paradigms, has P value = 0.104 (non-significant) but its regression weight was 0.458, which was the highest among the factors. Hence, it is still worthwhile to mention that the new learning paradigms positively affect teachers’ perceived readiness for OCL. Those who have positive belief towards the new learning paradigm are more ready for OCL. The positive belief can be obtained through constant exposure and experience in using the Internet and its various applications via the web. This factor should not be overlook because it enables teachers to be more ready for
using technology in education. As such, more ICT training and real application of OCL should be promoted to them so that they will be more aware of it and be able to use it confidently.

The total variance explained of the teachers’ perceived readiness model for using OCL is only 37%. There are surely other factors to explain other possible reasons affecting the teachers’ perceived readiness for using OCL in their schools. As reported in other research findings, factors such as teachers’ computer skills, personal characteristics, competency level in handling ICT, the institutional supports etc. are all the possible factors affecting teachers’ readiness for online-based learning (Sallimah & Albion, 2004).

As a recommendation, these factors should be included in future studies in order to investigate a more comprehensive model for predicting teachers’ readiness for OCL or online collaboration. Other recommendation is to construct a model to investigate the predictive factors affecting teachers’ readiness for OCL in Malaysian secondary schools through the SEM approach.

Limitation of the study

This study was bounded by some limitations. Firstly, the limitation of data analysis approaches using SEM. The ideal sample size suggested for SEM is 100-200 (Hair et al., 1998). However, the sample size used in this study was only 86. This could be the reason for getting moderate fit results in SEM. Besides, in the model, it can be seen that there were limited number of items (or indicators) to manifest a construct. Each construct should have at least three or more indicators or items (Hair et al., 1998). In this study, three constructs formed in the model had less than three items or indicators. This could be another reason for moderately fit results. Another limitation is the representation of the teachers who were chosen from the schools in a geographical part of Malaysia. Therefore, these findings cannot be generalized to the entire teacher population in Malaysia.

Conclusion

The findings of this study show that many of the teachers were neither agreed nor disagreed on their perceived readiness for OCL even though they were quite positively perceived the effects of OCL. The teachers did not express their readiness strongly because of time constraint and insufficient access to computer and the Internet at schools. These two factors are the perceived impediments to the implementation of OCL in schools.

Other factors such as collaborative intention and perceived positive effects of OCL did not affect teachers’ perceived readiness for OCL but these factors have positive relationship with the factor of “new learning paradigm” which emerged due to the advent of the Internet and the increase responsibility of learners in education. This newly emerged factor has some positive influence on the teachers’ perceived readiness for OCL. This implies that teachers with more positive attitude or belief towards new learning paradigm are more ready to adopt OCL. Many of the teachers also believe that the supports from school principal and training provider are the important conditions for them to practice OCL in schools.

The findings of this study were obtained based on a case study, conducted in a geographical part of Malaysia which was bounded into the context of Malaysian educational system and setting. Further research can be conducted to identify a more comprehensive model to explain teachers’ readiness for OCL by considering factors mentioned in this paper such as new learning paradigm, access to technology, time allocation for online collaborative learning, ICT skills and experiences and the levels of institutional supports.

References


